WILLIAM E. NEWKIRK
CONSULTANT

BURNERS - COAL - OIL - GAS
LIGHTERS - OIL - GAS
41 YEARS EXPERIENCE
DESIGN ENGINEERING - MANUFACTURING
FIELD SERVICE

April 4, 1991

Cecil James
Intermountain Power Service
Corporation
Delta, Utah 84624-9546

RE: IPSC Purchase Order 91-44450

Dear Mr. James:

The writer visited IPSC on March 25, 26, 27, 1991 to inspect the burners of unit #1. I wish to advise my recommendations are based on my visual observations of the burners as found on this inspection and from past inspections of this unit. As the unit was out of service, no burner operating conditions were observed.

All 48 burners were inspected from inside each windbox compartment. Furnace side inspection was not performed. An inspection sheet for each burner is attached to this report.

The mode of failure of these burners range from warped register plates, cracked welds, shifting of burner components, separation of register plates/register doors, and coal nozzle fires. These types of failures have been occuring from the start up of these units. The primary cause of these failures are due to thermal expansion resulting from furnace radiation and poor air distribution. The 70" throat dual register burners on this contract are larger than all previous dual register applications, whereas the radiant exposure to the burner would be more severe. The size of these burners greatly exceeds previous burners manufactured by B&W, however, standard design material specifications and manufacturing procedures remained the same. These conditions

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coupled with the inability to know or measure air flow to the individual windbox compartment, burner destruction would be inevitable. It is apparent from the condition of the burners that air distribution in windbox compartments is unsatisfactory, especially on out of service burners. It is almost incomprehensible to believe that cooling air is being distributed equally with this size of burner, which is adjusted for in-service operation, and windbox compartment pressure negative. The center burners indicate more severe warpage, weld failures and overheat. I would like to advise that many of the original welds were of poor quality, which would fail under normal conditions.

In regard to expected remaining burner life, one must first define burner life. My definition therefore is when the as designed equipment is no longer operational as the intended design due to physical changes of the assembled device and/or it can no longer function per the intended design, the burner life is expended.

Using this criteria, I am of the opinion that on each outage one will find burners that fall into the failed catagory. As time progresses degradation of the component parts will accelerate burner failures. Therefore, if no abnormal rehabilitation repairs were made I would project remaining life to be in the range of two to five years. Average utility boiler burner life is 25 to 30 years, unless subjected to severe operating conditions. I would advise that the condition of some of the burners seen on this inspection, in a short period of time could result in a windbox fire or explosion, both of which could result in extensive material damage or possible personnel injury.

It was observed during the burner inspection, several burners have had coal nozzle fires. The probable cause is due to coal particles settling out in the nozzle due to low nozzle volocity and hot nozzles. I recommend that each coal pipe should be tested to determine if the velocities are correct and the coal pipes are balanced per B&W specifications.

The slip seal casing, although all were attached, were warped and all packing was missing, which resulted in large gaps (1"-1½") permitting air to bypass the registers. This condition should be corrected or redesigned.

The outer registers are in poor condition ranging from failed welds, separated and warped plates, oxidation of register doors, ribs and front plates. The linkage from a material standpoint is in good condition, however, movement capability is rather doubtful. I recommend that the outer registers be replaced with a redesigned linkage arrangement (H-D type) and register components with stainless steel with increased temperature and creep strength capabilities. Support design should also be improved.

The inner register will be satisfactory providing that those with damaged spin vanes and split weld seams be repaired. It is my opinion the weld seams failed on some of the inner air sleeve due to overheat, closed spin vanes restricting air flow and poor welds. The spin vanes should not be pinched down or closed for air distribution purposes. The function of the spin vane is to generate swirl of inner air zone for stable ignition. The sliding disk is used to regulate air flow.

Compartment air flow appears to be questionable on this unit. As there is no means to measure flow, I suggest a diagnostic test to determine air flow to each burner, you may want to consider using the hot wire anemometer method through the coal nozzle and cold secondary air. If new burners/registers are installed, I would consider installing a permanent device for measuring air flow to each compartment.

Fire side inspection was not made on this inspection, as the furnace scaffold was not finished.

Attached are inspection sheets for each burner and photographs of typical burner damage. Also attached is my invoice, number 003-91 for my services.

I thank you for the opportunity to work with you, should you need my assistance in the future please advise.

Sincerely,

W.E. Newkirk

William E. Newkirk

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